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(19) (CA) **CANADIAN PATENT** (12)

(54) Shear Coupling Assembly

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## "SHEAR COUPLING ASSEMBLY"

ABSTRACT OF THE DISCLOSURE

A shear coupling assembly is provided for connecting the rod of a downhole pump with the terminal member of a sucker rod string. The assembly involves two parts or coupling members which are threadably connected end to end during normal operations but which can relatively easily be parted if the pump becomes stuck, by pulling up on the still free sucker rod string. The first coupling member has a pin end incorporating an externally threaded head and a shear neck, of relatively reduced diameter, joining the head to the main body of the coupling member. The head has an axial, internally threaded counterbore, so that a tensioning tool may be screwed thereinto, the other end of the coupling member may be held, and the tool may be pulled to place the shear neck in tension. The second coupling member is a sleeve forming an axial bore therethrough. The second coupling member is adapted to thread onto the head of the first coupling member. To prepare the assembly for use, the tensioning tool is inserted, the sleeve is slipped over the tool, the tool is pulled to place the neck in tension, and the sleeve is threaded along the head until it abuts the main body of the first coupling member. The tensioning tool is then removed. The sleeve functions to hold the shear neck in a tensioned state. The tensioned neck is better able to sustain cyclic compressive loading in the course of reciprocation of the sucker rod string.

Field of the Invention

The present invention relates to a shear coupling assembly for interconnecting the rod of a downhole pump with the terminal member of the rod string which actuates the pump. The assembly is adapted to preferentially part when the pump is stuck and the rod string is pulled.

BACKGROUND OF THE INVENTION

In a pumped well, a reciprocating rod string is used to actuate a downhole pump. The rod string is made up of a multiplicity of sucker rods connected end-to-end by means of threaded couplings. Typically, a sucker rod might have a length of 30 feet, a stem diameter of 5/8", an externally threaded 7/8" pin coupling at one end and an internally threaded 7/8" box coupling at the other end. Alternatively, a single continuous rod may be used to extend from the pump jack down to the pump. Hereafter the term "rod string" is used generically to denote the two types of pump-actuating rods.

There are occasions when the pump will become lodged or stuck in the well, either at its downhole operating position or when being tripped out of the well. For example, sand contained in the produced fluid may settle on top of the pump and prevent its upward removal.

It is then desirable to be able to separate the rod string from the pump, in order to remove it so that specialized equipment may be introduced into the tubing to free the pump.



1           In most wells, the operators do not provide for a  
2     parting means in the string at the juncture of the rods and  
3     the pump. If the pump is stuck, the rod string is simply  
4     pulled until parting occurs. This break can occur anywhere  
5     in the rod string, which can be a problem.

6           Heretofore, there have been shear assemblies used  
7     at the junction of the pump and the rod string. The version  
8     which we have seen in use involves joining male and female  
9     coupling members with transversely extending shear pins. The  
10    shear pins are designed to part before the stem of a sucker  
11    rod. However, there are two problems associated with this  
12    assembly. Firstly, the shear pins are prone to premature  
13    fatigue. This fatigue arises from the cyclic compressive  
14    stress which is induced in the shear pins if the rod string  
15    "taps down" at the base of each downstroke. Secondly, when  
16    the shear pins are broken, their splinters drop onto the  
17    pump; this can lead to problems in freeing the pump.

18           There exists, therefore, a need for a rod string  
19    shear coupling assembly which is better adapted to undergo  
20    cyclic compressive loading without failure and which may be  
21    pulled apart without producing splinter pieces that are free  
22    to drop down the tubing annulus.

#### 23           SUMMARY OF THE INVENTION

24           In accordance with the invention, a shear coupling  
25    assembly is provided having a pin coupling member and a box  
26    coupling member. The pin coupling member has a pin end  
27    comprising an externally threaded head and a shear neck, of  
28    relatively reduced diameter, joining the head to the main

1 body of the coupling member. The head is counterbored  
2 longitudinally from its forward end and internally threaded.  
3 The main body of the pin coupling member is provided with  
4 means for threadably connecting the member to the sucker rod  
5 string or, if inverted, to the pump. The main body further  
6 provides a contact shoulder for a purpose explained shortly.  
7 The box coupling member is an internally threaded sleeve into  
8 which the head of the pin coupling member may be threaded.  
9 The box coupling member also has means for threadably  
10 connecting it to the rod string or pump, as appropriate.

11 In assembling the device, the body of the pin  
12 coupling member is held, a threaded tensioning tool, such as  
13 a bolt or the like, is screwed into the head, the box  
14 coupling member is slipped over the bolt, and a pull is  
15 applied to the bolt to tension the shear neck. The box  
16 coupling member is then screwed along the head until it abuts  
17 the pin coupling member by contacting the aforementioned  
18 contact shoulder. The bolt is then released and removed.  
19 The box coupling member functions to "lock in" the tension  
20 stress induced in the shear neck by pulling on the bolt.  
21 Stated otherwise, the shear neck remains in a tensioned  
22 state.

23 Broadly stated, the invention is a shear coupling  
24 assembly for connecting the rod of a downhole pump with the  
25 terminal member of a rod string, comprising: a pin coupling  
26 member having a pin end portion and a body end portion, said  
27 pin end portion comprising an externally threaded head and a  
28 shear neck joining the head to the body portion, said shear  
29 neck being of sufficiently reduced diameter so that it will

preferentially part when the pump is stuck and the rod string is increasingly tensioned, said body portion having means, at its end remote from the head, for threadably connecting with one of the rod string or pump rod, said head having means for connecting with a tensioning tool; and a box coupling member comprising an internally threaded sleeve threadably engaging the head and having means for threadably connecting with the other of the rod string or pump rod; said sleeve contacting the body end portion of the pin coupling member; said shear neck being in a tensioned state.

#### DESCRIPTION OF THE DRAWING

Figure 1 is a sectional side view of one embodiment of the shear coupling assembly; and

Figure 2 is a partly sectional side view of an alternative embodiment of the assembly.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to Figure 1, the shear coupling assembly 1 comprises a pin coupling member 2 and a box coupling member 3.

The pin coupling member 2 comprises a body portion 4, an externally threaded head 5 and a shear neck 6 joining the head 5 with the body portion 4. The body portion 4 is of greater width than the head 5 and forms a radial contact shoulder 7. The shear neck 6 is of reduced diameter relative to the head 5. Specifically the shear neck 6 is designed to preferentially part before the rod string (not shown) or pump rod (also not shown), when the pump is stuck and the rod

1 string is subjected to increasing tension. The head 5 forms  
2 an internally threaded axial counterbore 8 which extends  
3 inwardly from its forward end. At its end remote from the  
4 head 5, the body portion 4 forms an internally threaded axial  
5 bore 9, for connecting to one of the rod string or pump rod.

6 Turning now to the box coupling member 3, it  
7 comprises a sleeve 11 forming an internally threaded axial  
8 bore 12. One end of the sleeve 11 is dimensioned to  
9 threadably engage the head 5 and advance thereover. The  
10 other end of the sleeve 11 is adapted to thread onto the pin  
11 end of the other of the rod string or pump rod.

12 To assemble the device, the body portion 4 of the  
13 pin coupling member 2 is suitably held and a bolt (not  
14 shown) is threaded into the head counterbore 8. The sleeve 11  
15 is slipped over the bolt. The bolt is then tensioned by  
16 pulling on it, to thereby place the shear neck 6 in tension.  
17 The sleeve 11 is then advanced along the head 5 until it  
18 abuts the contact shoulder 7. The bolt is then removed. The  
19 sleeve 11 functions to lock the shear neck 6 in a tensioned  
20 state.

21 The alternative embodiment shown in Figure 2 is  
22 essentially the same as that shown in Figure 1. In this  
23 case, the body portion 4 is provided with a threaded pin 10  
24 for connection with the rod string or pump rod. Similarly, if  
25 desired the end of the sleeve 11 may be formed to provide a  
26 pin at its end remote from the head 5.

1           The invention is characterized by the following  
2 advantages:  
3           -    there are no shear pin parts left free to drop  
4                down the tubing annulus when parting occurs;  
5                and  
6           -    the tensioned shear neck should remain in  
7                tension even though the rod string may be  
8                cyclically tapping down.  
9           The scope of the invention is set forth in the  
10 following claim.



1 THE EMBODIMENTS OF THE INVENTION IN WHICH AN  
2 EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS  
3 FOLLOWS:

4 1. A shear coupling assembly for connecting the  
5 rod of a downhole pump with the terminal member of a rod  
6 string, comprising:

7 a pin coupling member having a pin end portion and  
8 a body end portion, said pin end portion comprising an  
9 externally threaded head and a shear neck joining the head to  
10 the body portion, said shear neck being of sufficiently  
11 reduced diameter so that it will preferentially part when the  
12 pump is stuck and the rod string is increasingly tensioned,  
13 said body portion having means, at its end remote from the  
14 head, for threadably connecting with one of the rod string or  
15 pump rod, said head having means for connecting with a  
16 tensioning tool; and

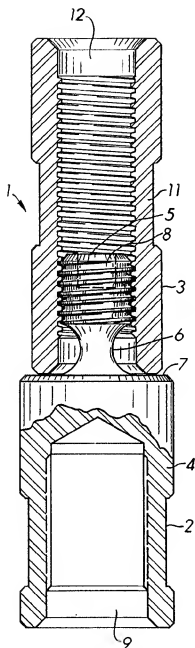
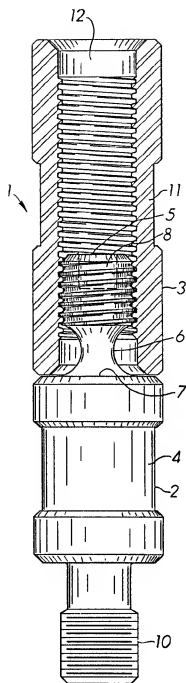
17 a box coupling member comprising an internally  
18 threaded sleeve threadably engaging the head and having means  
19 for threadably connecting with the other of the rod string or  
20 pump;

21 said sleeve contacting the body end portion of the  
22 pin coupling member;

23 said shear neck being in a tensioned state.

24 2. The assembly as set forth in claim 1 wherein:  
25 the head forms an internally threaded counter bore  
26 extending axially inwardly from its end to provide the means  
27 for connecting with a tensioning tool.



Fig. 1.Fig. 2.

Patent agent:

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